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INCIDENCE OF HETEROBASIDION ANNOSUM STUMP INFECTION IN EASTSIDE PINE TYPE STANDS ON THE PLUMAS AND TAHOE NATIONAL FORESTS

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ABSTRACT

Eleven eastside pine type stands on the Plumas and Tahoe National Forests were surveyed to determine the current levels of annosus root disease. Pine stump infection levels averaged 22% on the Plumas and 14% on the Tahoe, with an average of 0.3 active annosus root disease centers per acre observed. Larger diameter stumps were more likely to have Heterobasidion annosum conks than smaller diameter stumps. Because treatment of freshly cut pine stumps is effective in preventing infection, boraxing of pine stumps in commercial timber sales in eastside pine type stands on the two Forests is recommended.

INTRODUCTION

Historical information from the Lassen National Forest (Smith 1983) and a 1986 biological evaluation (Kliejunas, 1986) on the Modoc National Forest indicated relatively high levels of annosus root disease, caused by Heterobasidion annosum, in eastside pine type stands. Based on this information, current policy on both Forests is to apply borax (sodium tetraborate decahydrate) to freshly-cut pine stumps in all commercial timber sales to prevent H. annosum infection.

Because information on the current levels of annosus root disease in the eastside pine type stands on the Plumas and Tahoe National Forests were lacking, an evaluation of the two Forests was conducted in July of this year. The objectives of this evaluation were to determine the levels of H. annosum currently present in the eastside pine type on the Plumas and Tahoe National Forests and to provide this information to the Forests for their use in determining if the use of borax is warranted.

PROCEDURE

Six sale areas, cut in the late 1960s or early 1970s, on the Milford Ranger District, Plumas National Forest, and five areas cut 10 or more to 20 or more years ago on the Truckee Ranger District, Tahoe National Forest, were examined during the week of June 26-30, 1989. See Appendix for maps of stand

locations. All areas were in the eastside pine type, consisting of predominately ponderosa pine, varying amounts of Jeffrey pine, white fir, and western juniper, and various shrubs and grasses. Stumps had not been boraxed in the areas examined.

In each area, a one chain-wide strip survey was run for at least 20, and up to 110, chains. All pine stumps within the strips were measured for diameter and examined for the presence of H. annosum. If H. annosum conks were found in or on a stump, the stump was recorded as infected. If no conks were present, it was tallied as not infected. Dead and dying trees around the stumps were noted and estimates of area of each root disease center were made.

RESULTS

Results from the eleven areas examined are presented in Table 1. Stump infection averaged 22% on the Plumas and 14% on the Tahoe, with considerable variation among areas on both Forests. Infection rates on the Plumas ranged from 12% on the Ferris sale to 34% on the Dixie, and ranged from 4% (Hobart Reservoir) to 23% (Woodchopper Spring 2) on the Tahoe.

An average of 0.3 active annosus root disease centers per acre were recorded. Although none were observed on 5 of the 11 areas, active annosus centers were evident and causing current mortality at six locations, in particular at the Ferris and Dixie sales on the Plumas and at Boca Springs and Woodchopper Spring 1 on the Tahoe. If, as an estimate, each active center averaged 0.1 acre, than about 3 percent of each acre surveyed was out of production due to annosus root disease. In terms of the survey, 1.6 of the 52.7 acres examined were infested with active annosus root disease.

Stump infection varied with stump diameter (Table 2). In general, larger diameter stumps were more likely to have H. annosum conks than smaller diameter stumps. Only 2 of the 173 pine stumps less than 18 inches in diameter had conks.

DISCUSSION

The rates of pine stump infection found in the eastside pine type forests surveyed on the Plumas (22%) and Tahoe (14%) are lower than rates found in the eastside pine type on the Modoc (50%), but comparable to those reported on the Lassen National Forest (5 to 15%). The numbers of infected pine stumps in the areas examined are conservative and probably higher than recorded because only stumps with conks were counted as infected. Relatively recent stumps, such as those at Hobart Reservoir, may have been infected, but had not broken down sufficiently for conks to form in decayed tissues.

The average of 0.3 active annosus root disease centers per acre observed on the Plumas and Tahoe National Forests was relatively low compared to other eastside pine type forests. For example, a survey on the Modoc (Kliejunas 1986) found

an average of 1.9 active centers per acre for 10 sale areas examined. The reasons for these differences are unknown.

Treatment of freshly cut conifer stumps with borax is about 90 to 95% effective in preventing infection by H. annosum. Past studies in eastside pine type forests have resulted in a general rule that, where a survey of stumps from past cuttings indicate a stump infection rate of 5 to 10 percent or higher, treatment of all pine stumps with borax at the time of cutting should be considered (Smith 1983). Initially, an 8 inch diameter lower limit was suggested because research (R. S. Smith unpublished) found that stumps smaller than 8 inches diameter are only rarely successfully infected. However, field observations, which seldom indicate annosus spreading from stumps less than about 16 inches diameter, and recent studies (DeNitto 1985, DeNitto 1988, Kliejunas 1986) on diameters of infected stumps, which indicate little infection of stumps smaller than about 14 inches diameter, suggest that the diameter limit could be raised to commercial size. In eastside pine type stands, "commercial" can vary from about a 12 inch diameter stump in normal sales to 16 to 18 inches in fire salvage sales.

Results of this survey suggest that annosus root disease levels are, except for the Modoc where levels are exceptionally high, similar throughout the eastside pine type in northeastern California. Borax is apparently effective in reducing levels of infection in the type. Surveys of boraxed and non-boraxed sale areas on the Modoc and Lassen National Forests found greatly reduced levels of annosus root disease in areas that were boraxed (Kliejunas unpublished). Based on this and other historical information, borax is routinely used in commercial timber sales on the Modoc and Lassen National Forests. Adoption of the same policy in eastside pine type stands on the Plumas and Tahoe National Forests would likely reduce future losses to annosus root disease.

LITERATURE CITED

DeNitto, G.A. 1985. Evaluation of Fomes annosus in pre-commercially thinned pine stands on the Lassen National Forest. Rept. No. 85-36. San Francisco: Pacific Southwest Region, U.S. Department of Agriculture, Forest Service; 2 p.

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Table 1. Incidence of Heterobasidion annosum stump infection at 11 locations in eastside pine type stands on the Plumas and Tahoe National Forests.

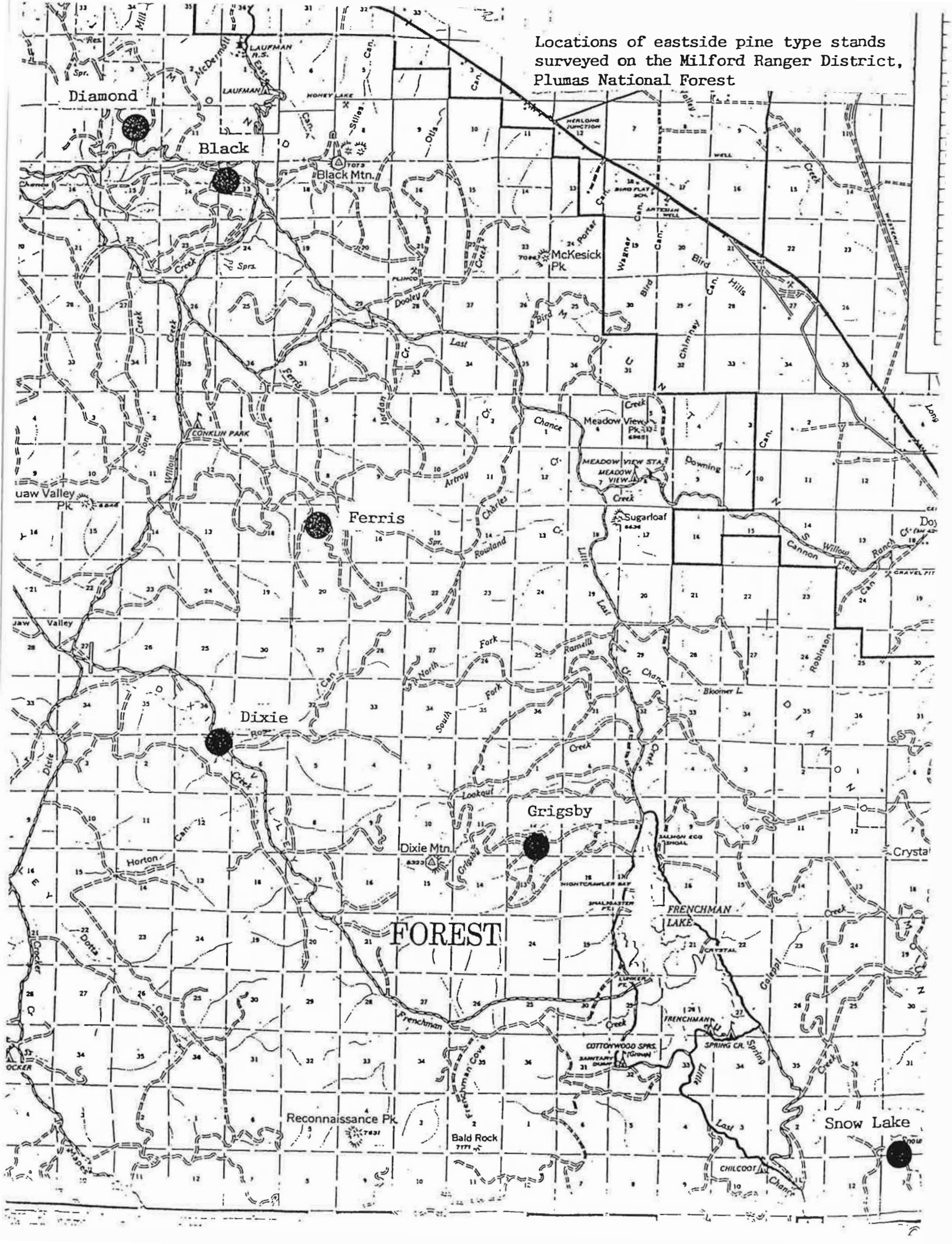
Location	Year Cut	Area Sampled	Pine Stumps Infected		No. Active Centers[1]	
		acres	No.	%	Total	Per Acre
Plumas N.F. (Milford R.D.)						
Ferris	1972-1973	2.0	3/25	12	1	0.5
Diamond	1972-1973	2.6	5/40	13	0	0
Black	1972-1973	5.1	11/80	14	1	0.2
Snow Lake	1965-1966	2.4	8/35	23	0	0
Grigsby	1969-1970	4.9	9/30	30	0	0
Dixie	1974	11.0	31/90	34	10	0.9
Total (Average)		28.0	67/300	22	12	(0.4)
Tahoe N.F. (Truckee R.D.)						
Hobart Reservoir	10+[2]	4.6	2/55	4	0	0
Stampede Reservoir	10+	2.3	11/175	6	0	0
Boca Springs	10+	6.3	20/100	20	3	0.5
Woodchopper Spring 1	20+	3.5	11/50	22	2	0.6
Woodchopper Spring 2	20+	8.0	23/100	23	1	0.1
Total (Average)		24.7	67/480	14	6	(0.2)
Grand Total (Average)		52.7	134/780	17	18	(0.3)

[1] Based on the presence of a dying or recently dead pine (s) adjacent to the stump. An area with more than one stump associated with the dying or recently dead trees was counted as one active annosus root disease center.

[2] 10+ = areas in which cutting occurred 10 or more years ago.
20+ = areas in which cutting occurred 10 or more and 20 or more years ago.

Table 2. Pine stumps with conks of Heterobasidion annosum, by diameter class, on eleven areas in eastside pine type stands on the Plumas and Tahoe National Forests.

Stump Diameter inches	Total	With Conks	Infected %
less than 12	63	0	0
12 to 18	110	2	2
18 to 22	80	4	5
22 to 26	62	7	11
26 to 30	70	9	13
30 to 34	86	18	21
34 to 38	58	12	21
38 to 42	81	18	22
42 or more	170	64	38
TOTALS	780	134	17



Locations of eastside pine type stands surveyed on the Milford Ranger District, Plumas National Forest

APPENDIX 2

Locations of eastside pine type stands surveyed on the Truckee Ranger District, Tahoe National Forest